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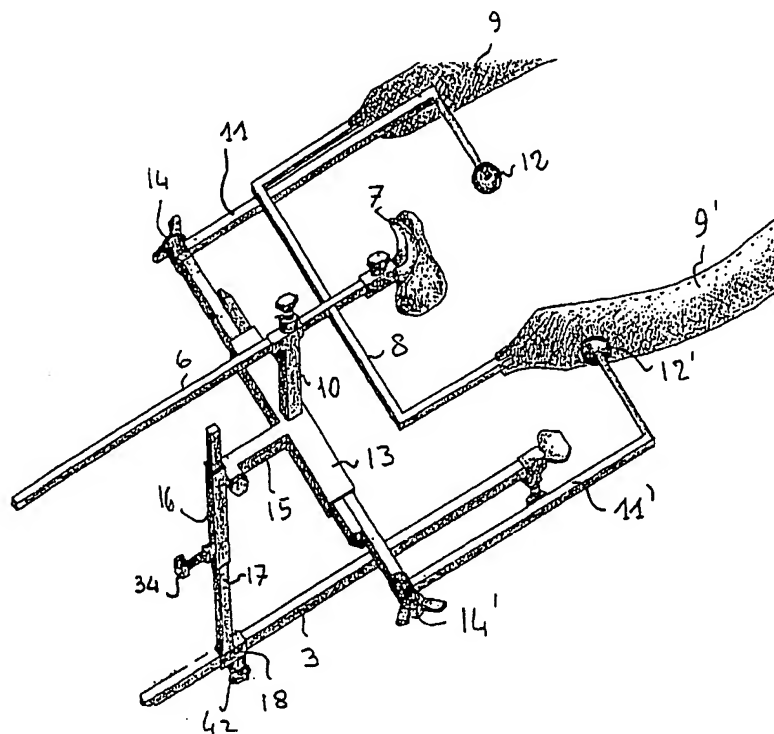
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: EQUIPMENT FOR CARRYING OUT FIXED AND MOVABLE DENTAL PROSTHESIS

## (57) Abstract

Equipment for executing permanent and movable dental prostheses comprising an apparatus for dental measurements and a group of metal cores and pins for the preparation of the impressions. The measuring apparatus comprises a nasal collimation device (1) connected to an underlying auricular collimation device (2) and under this, horizontally, is slidingly mounted a graduated rod (3) suitable for bearing a palatal collimation device (4) or a labial collimation device (5). The apparatus comprises also a bracket for the determination of the Kamper plane as well as a spirit level applied to the nasal collimation device (1). The metal cores comprise also a pin having varying length and a writing tip.



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"EQUIPMENT FOR CARRYING OUT FIXED AND MOVABLE DENTAL  
PROSTHESES"

The present invention relates to an equipment for executing permanent and movable dental prostheses quickly and without using mastication waxes.

5       The reconstruction of the so-called simple prostheses, with techniques that turn out to be expensive because of the great amount of time requested for executing them, is known to be the problem arising with relative frequency in dentistry. Further, the techniques of the state of the art are known to involve the use of the so-called mastication waxes, which are disadvantageous as they often  
10       result in condyle dislocation and therefore in the execution of a prosthesis unsuitable for that patient.

Therefore, object of the present invention is providing an equipment allowing both permanent and movable dental prostheses to be executed, without the above mentioned disadvantages.

15       Said object is obtained by means of an equipment comprising an apparatus for carrying out the necessary dental measurements and a group of metal cores and pins for preparing the impressions. The features of the measuring apparatus are specified in claim 2 and dependent claims. The features of the group of metal cores and pins for preparing the impressions are specified in claim 8 and following  
20       claims.

Besides enabling the dental technician to carry out quickly and precisely the necessary registrations, the equipment according to the present invention offers the further advantage of being easily handled and used.

25       Another advantage offered by the equipment according to the present invention is that, besides enabling impressions to be taken without using mastication waxes, it reduces to only two or three the number of sittings necessary for the prostheses execution.

These and other advantages will be apparent to those which are skilled in the art from the following detailed description of one embodiment thereof, with  
30       reference to the accompanying drawings, wherein:

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- Figure 1 shows a perspective view of a measuring apparatus according to the present invention;
- Figure 2 shows another member of the apparatus of Figure 1;
- Figure 3 shows a further member of the apparatus of Figure 1;
- 5     - Figure 4 shows an accessory of the apparatus of Figure 1;
- Figure 5 shows the use of the measuring apparatus according to the present invention;
- Figures 6 and 6bis show the use of a simplified embodiment of the measuring apparatus according to the present invention;
- 10     - Figures 7 to 10 show few embodiments of the metal cores for the impression preparation by the equipment according to the present invention; and
- Figure 11 shows a writing pin that belongs to the group for the impression preparation by the equipment according to the present invention.

With reference to Figure 1, the measuring apparatus according to the present  
15 invention is shown to comprise a nasal collimation device 1 connected to an underlying auricular collimation device 2 and, under this, a horizontal graduated rod 3 suitable for supporting the palatal collimation device 4 or the labial collimation device 5 is slidably mounted.

The nasal collimation device 1, of a known kind, is substantially formed of a  
20 bar 6 bearing, at one end, a nosepiece 7, which is anatomically structured so as to rest on the patient's nasal septum. Said nosepiece bears a seat receiving the end of bar 6, whereto it is applied. Bar 6 is integral with a transversal bar 8, that is orthogonal to bar 6 and bears at its free ends straps 9 and 9'. The ends of straps 9 and 9' are provided with means for fastening them around the patient's head. In  
25 the simplest embodiment, the ends of straps 9 and 9' are provided with a Velcro tape (not shown).

Bar 6 can slide horizontally inside a bush that is positioned at the upper end of a vertical spacer 10 bearing at the base the auricular collimation device 2.

Auricular collimation device 2, also of a known kind, is substantially formed  
30 of two specularly identical brackets, 11 and 11', each having one end provided

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with clamping balls 12 and 12'. These balls are intended to rest precisely inside the cavity of the patient's auricle concha. The free ends of the brackets 11 and 11' are slidably mounted inside a horizontal tubular housing 13 positioned at the base of vertical spacer 10. In the embodiment shown in the drawing, the throw of  
5 brackets 11 and 11', next to the relevant free end, is respectively articulated with wing nuts 14 and 14'. In a simplified embodiment, brackets 11 and 11' are produced with round sectioned metal rod, which eliminates the need for wing nuts 14 and 14'. In fact, in that case, the ends of brackets 11 and 11' can be rotated inside housing 13 and fixed in the desired position by means of a check pin.

10 The free ends of brackets 11 and 11' can slide horizontally inside housing 13 and are stopped in the desired position by means of a setscrew (not shown in the figure) which is positioned under spacer 10.

The back of housing 13 is provided with a horizontal extension 15 bearing at one end a second vertical spacer 16, internally hollow, inside which a small shaft  
15 17 is slidably housed. This bears at the base a horizontal bush 18 that slidably receives graduated rod 3. Rod 3 can be brought to the desired position and there blocked by means of a screw pin 42 positioned under bush 18. Another screw pin 34 is used to fasten shaft 17 at a certain height inside vertical spacer 16.

Graduated rod 3 has a millimetric scale that allows the horizontal position of  
20 collimation device 4 or 5 to be exactly determined when this, being fastened at the end of graduated rod 3, is used in the measuring practice. After having slid rod 3 until device 4 or 5 reaches exactly the patient's palatal cupula or lips, the rod is fastened by screw pin 42, the measure is read on the graduated scale and the value is communicated to the dental technician.

25 With reference to Figure 2, palatal collimation device 4 is seen to comprise substantially a threaded pin 19 intended to be screwed into a base 20, internally hollow and provided with a thread. Such a base supports a plate 21, both base and overlying plate being intended to be incorporated into the paste for impressions that is to be used for molding the patient's palatal zone, as described in the  
30 following. While using the equipment, plate 21 will be positioned exactly at the patient's palatal cupula and that position will be read on the millimetric scale of

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rod 3. Graduated rod 3 has at the distal end, with respect to the millimetric graduation, a hole suitable for housing pin 19 of collimation device 4.

With reference to Figure 3, there is shown the other collimation device that forms the apparatus according to the present invention, i.e. labial collimation device 5. This is substantially formed of a threaded pin, provided with a screw or nut head, having the other end suitable to be screwed into a plaque holder contrivance. This contrivance comprises a base 24 bearing a support 25 that can be opened, whereinto a sleeve 26 is inserted. Sleeve 26 bears a plate 27 on which a sheath 28 is fastened, wherein a rod 29, bearing at the end the labial plaque 30, can be secured. Said plaque is anatomically shaped as shown in the figure and is intended to be introduced between the patient's lips. In such a position plaque 30 divides the two parts of the toothless mouth and serves for all the registrations in the execution of the upper and lower complete prostheses (dentures).

With reference to Figure 4, the measuring apparatus according to the present invention is seen to comprise also bracket 31 serving for determining the Kamper plane. It is preferably shaped with the two arms 32 and 32' substantially parallel in order to allow a perfect alignment with the patient's face. The two arms 32 and 32' have one free end while the other end is sliding inside a sleeve 33. In this way the two arms can be driven near and away from each other, according to the patient's face size. Sleeve 33 is provided with two screw pins (not shown in the figure) in order to block the two bracket arms in the requested position. Bracket 31 is applied on the patient's face so that sleeve 33 fits to the nasal septum and the ends of the two arms 32 and 32' correspond to the patient's ear tragus.

Since it is known that the position of the body affects the one of the jaw, it is always necessary to value the vertical dimension at rest when the patient is standing or sitting in a usual, symmetrical position. By means of a spirit level placed on collimation device 1, it is easily possible to balance perfectly the patient's head with the nuchal and vertebral muscles. The horizontal position of nasal collimation device 1 and therefore the patient's body vertical position can be determined by centering the bubble in the glass tube. This preliminary operation is very important to determine the positions that are technically named vertical

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dimension and centric occlusion. The applicant has produced a small spirit level provided with a small central sleeve, allowing the insertion thereof on the free end of bar 6.

With reference to Figure 5 the measuring apparatus according to the present invention is shown applied on a patient's head. With the help of a spirit level, bar 6 has been brought to a perfectly horizontal position, whereupon auricular collimation device has been brought to the position in which clamping balls 12 and 12' are positioned exactly inside the patient's auricle.

The Figure also shows bracket 31 positioned for determining the Kamper plane.

In the Figure, graduated rod 3 bears the labial plaque 30 serving for the registrations requested to execute both upper and lower complete prostheses (dentures).

In Figure 6 another embodiment of the measuring apparatus according to the present invention is shown in the use wherein graduated rod 3 bears at the end palatal collimation device 4. The Figure shows the moment in which the operator, after having read on the graduation of graduated rod 3 the exact position of palatal collimation device 4 inside the patient's mouth (position illustrated in Figure 2), has loosened threaded pin 42 and slid rod 3 sideways as to pull out palatal collimation device 4, whereon the patient's palatal impression is left.

The apparatus shown in Figure 6bis represents a second embodiment of the measuring apparatus according to the present invention. In comparison with the one shown in Figure 1, it is structurally simplified and differs from that one in that auricular collimation device can be separated from nasal collimation device to be replaced from graduated rod 3. In this embodiment auricular collimation device is not fastened inside tubular housing 13 positioned at the base of vertical spacer 10, but directly inside said spacer, that is internally hollow, and where it can be maintained by means of a threaded pin in the position of adjustment to the patient's face. In this simplified embodiment auricular collimation device 2 is substantially formed of a square having one quadrate sectioned arm 35 suitable to be inserted inside vertical spacer 10 and of a orthogonal arm 36 having a round

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section and internally hollow. The internal cavity of arm 36 is intended to house free end 37, bent at 90°, of rod 38, also having a round section and a size so as to allow its insertion inside the cavity of arm 36 of said square.

The other end of rod 38 bears a sleeve 39 parallel to end 37 bent at right angles and suitable for slidably receiving the stem 40 of a clamping ball 41. This very simplified embodiment can be used indifferently on anyone of the patient's ears. This is accomplished by pulling the quadrate sectioned arm 35 out from vertical spacer 10 and by reinserting it after a 180° rotation on the horizontal plane and by rotating then rod 38 of 90° on the vertical plane, as far as clamping ball 41 has reached the patient's auricle. In order to adjust the position of clamping ball 41 inside the patient's ear, the stem 40 thereof is slid inside sleeve 39 until the optimal position is obtained. Once the so-called typical spatial position of the patient is determined, the simplified auricular collimation device is pulled out from the lower end of spacer 10 and replaced with shaft 17 (shown in Figure 1) bearing at the end graduated rod 3.

The applicant has discovered that, when the paste for impressions is applied onto the patient's palate, something can be conveniently incorporated therein, in order to render the paste firmer, without affecting its shapability. Further, in order to avoid condyle dislocation, which the present invention intends to eliminate, the paste must not invade the space between the teeth. This is obtained, according to the present invention, with the group of metal cores which is also subject matter of the present invention.

In Figures 7 and 8 two embodiments of metal cores forming an object of the apparatus according to the present invention are shown. The embodiment shown in Figure 7 is used for preparing impressions for the upper permanent prostheses, while the embodiment shown in Figure 8 is used for preparing impressions for the lower permanent prostheses. The metal core of Figure 7 has a particular shape, approximately resembling a half-moon with a large radial slit that makes it more shapable. In fact, this core has to be hand shaped in order to be adapted as far as possible to the patient's palate surface. Furthermore, it is provided with slits 43 and 43' serving to hold respectively one hem of segment of wire net 44 and 44'.



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The most suitable net for this purpose is a brass net of the kind used by sculptors for stiffening plastiline models. A net having these features can guarantee cohesion of the pasty mass, particularly in the parts corresponding to the toothless zones, or to the zones with filed teeth, in the patient's mouth. The wire net, being  
5 very adaptable, can be easily shaped also over the mutilated teeth, already prepared for the prosthesis. The rest of the metal core is preferably made of tin.

Both metal cores are provided, in the incisor area, with an internally threaded hole 45. Such a hole is intended to receive another member of the apparatus according to the present invention, that is a pin whose structure and  
10 function will be described in detail with reference to Figure 11.

The embodiments of metal cores shown in Figures 9 and 10 serve for preparing impressions necessary for executing movable, that is total, prostheses. Their shape resembles approximately that of a horse shoe and they are provided with an internally threaded hole 45, that has the same purpose above mentioned  
15 with reference to Figures 7 and 8. The metal core shown in Figure 9 serves for preparing the upper impression and is provided with one or more notches 46 having the purpose of creating reference points in the paste for impressions previously positioned in the cavities of the metal core of Figure 10. Said reference  
20 points are useful when upper and lower impressions are joined and sent to the dental technical laboratory. In Figure 10 can be seen the two cavities 47 and 47' containing the paste for impressions. Since this metal cores are used for impressions in toothless mouths, the use of wire net segments 44 and 44' can turn out to be unnecessary.

First, in order to prepare the impression, the paste for impressions whereinto  
25 the metal core of Figure 7 has been for example incorporated, is pressed in the known way against the patient's palate. When the technician realizes that the core incorporating paste adheres perfectly to the patient's palate, he creates with his finger a niche corresponding to the palatal cupula and then lets the impression harden. Once this hardening has taken place, a further small quantity of paste for  
30 impressions is inserted in the so obtained niche, whereinto plate 21 with the relevant threaded base 20 of palatal collimation device 4 are inserted. Both plate

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21 and corresponding base 20 remain in position also while the paste hardens. Once the measuring apparatus according to the present invention has been mounted on the patient's head, graduated rod 3 is moved forward inside the mouth until threaded pin 19 mounted on rod 3 reaches threaded base 20 incorporated in  
5 the hardened paste and then pin 19 is screwed into the base itself. In this way, an impression is obtained while avoiding the paste to get in contact with the teeth and also the use of the so-called mastication waxes. This impression, once pulled out from the patient's mouth, can be used for the next shaping operations of the prosthesis.

10 Another important member of the apparatus according to the present invention is formed of a set of eight pins 48 whose increasing length is included between 6 and 20 mm, which allow the position of the patient's jaws to be raised and lowered while millimetrically calculating the different positions which the technician looks for in order to find the so-called free space in the patient. This  
15 expression is well known to all dental technicians and therefore needs no further explanation.

With reference to Figure 11, it can be seen that pin 48 has substantially a prismatic shape with a preferably hexagonal section. A threaded tang 49 protrudes from the base thereof, which is useful for screwing pin 48 into holes 45 provided  
20 in the incisor area of the metal cores shown in the Figures 7 to 10. Pin 48 is internally hollow and in the cavity thereof is housed a thin graphite lead 50 which is moved forward, as it is consumed, by an adjusting screw (not shown in the Figure) which is positioned inside threaded tang 49.

When a pin 48 is screwed inside hole 45 of the cores of Figure 7 or 9, a  
25 plate, suitable to be marked by the tip of lead 50 housed inside pin 48, is screwed in the hole 45 of the facing shapes of Figure 8 and 10. Obviously, when pin 48 is screwed in holes 45 of the cores shown in Figures 8 and 10, the procedure is inverted. When the patient's two jaws are touching in front, the tip of lead 50 leaves a sign on the underlying plate. The patient is therefore invited to open and  
30 close repeatedly the mouth and the technician will be able to check whether the mark left each time by the tip of the lead 50 on the plate coincides with the former

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ones. This constitutes an evidence that the patient opens and closes the mouth always in the same way. Should that not be the case, the technician, still with the help of the pin with the writing tip, succeeds after many trials to identify the position that he considers as the most correct.

- 5           In order to determine the so-called free space, the technician chooses one pin 48 of the set which is subject matter of the present invention and tries it. If the pin has not the right length, the technician changes it with a longer or shorter one, according to the case. Since the difference in height between one pin and the closest of the set is 2mm, if the last tried pin is not exactly the desired one, it can
- 10   be rotated once inside hole 45, thus obtaining an increase in height of 1 mm so as to reach a better approximation in the identification of the so-called free space.

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## CLAIMS

1. Equipment for executing permanent and movable dental prostheses comprising an apparatus for dental measurements and a group of metal cores and pins for the preparation of the impressions.
2. Apparatus for dental measurements comprising a nasal collimation device (1) connected to an underlying auricular collimation device (2) by means of a vertical spacer (10), characterized in that under the auricular collimation device (2) is slidably mounted, horizontally, inside a second vertical spacer (16), a graduated rod (3) suitable for bearing at one end thereof a palatal collimation device (4) or a labial collimation device (5).
3. Apparatus according to claim 2, characterized in that the palatal collimation device (4) comprises a threaded pin (19) applicable at the end of the graduated rod (3), an internally threaded base (20) suitable for being screwed to the threaded pin (19) and bearing a plate (21) suitable to be incorporated in a paste for dental impressions.
4. Apparatus according to claim 2, characterized in that the labial collimation device (5) comprises an anatomically shaped plaque (30) suitably for being articulately connected with the end of the graduated rod (3).
5. Apparatus according to claim 4, characterized in that the labial plaque (30) is articulately connected to the graduated rod (3) by means of a base (24) applicable to the graduated rod (3) and bearing a support (25) that can be opened, whereinto is inserted a sleeve (26) bearing a plate (27) whereon is fastened a sheath (28) whereinto can be fixed a rod (29) that bears at the end the labial plaque (30).
6. Apparatus according to the preceding claims, characterized in that it comprises also a bracket (31) formed of two arms (32, 32') having one free end parallel to that of the other arm and the other end bent at 90° with respect to the first one and slidable inside a sleeve (33).
7. Apparatus according to the preceding claims, characterized in that it comprises also a spirit level applied to the nasal collimation device (1).
8. Apparatus according to claim 2, characterized in that the auricular collimation device is formed of a square having one quadrate sectioned arm (35) suitable to be

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slidably inserted inside vertical spacer (10) and of a round sectioned arm (36), internally hollow, intended to receive an end (37) bent at right angles, of a round sectioned rod (38), bearing at the other end a sleeve (39) parallel to end (37) and slidably receiving the stem (40) of a clamping ball (41).

9. Metal cores for preparing impressions for the execution of permanent dental prostheses, each characterized in that it is provided with slits (43, 43') that retain hems of wire nets (44, 44'), and an internally threaded hole (45) positioned in the incisor area.
10. Metal cores for preparing impressions for executing movable prostheses, each characterized in that it has substantially the shape of a horse shoe, of which the one for the upper impression is provided with one or more notches (46) and the one for the lower impression is provided with two cavities (47, 47'), both metal cavities being provided with one hole (45) interposed between said notches (46) and said cavities (47, 47').
11. Set of pins for preparing impressions for the execution of movable and permanent prostheses, each characterized in that it has a substantially prismatic shape (48) having at the base a threaded tang (49) and an internal longitudinal cavity wherein a graphite lead (50) is housed, whose tip is suitable to protrude from the pin tip.

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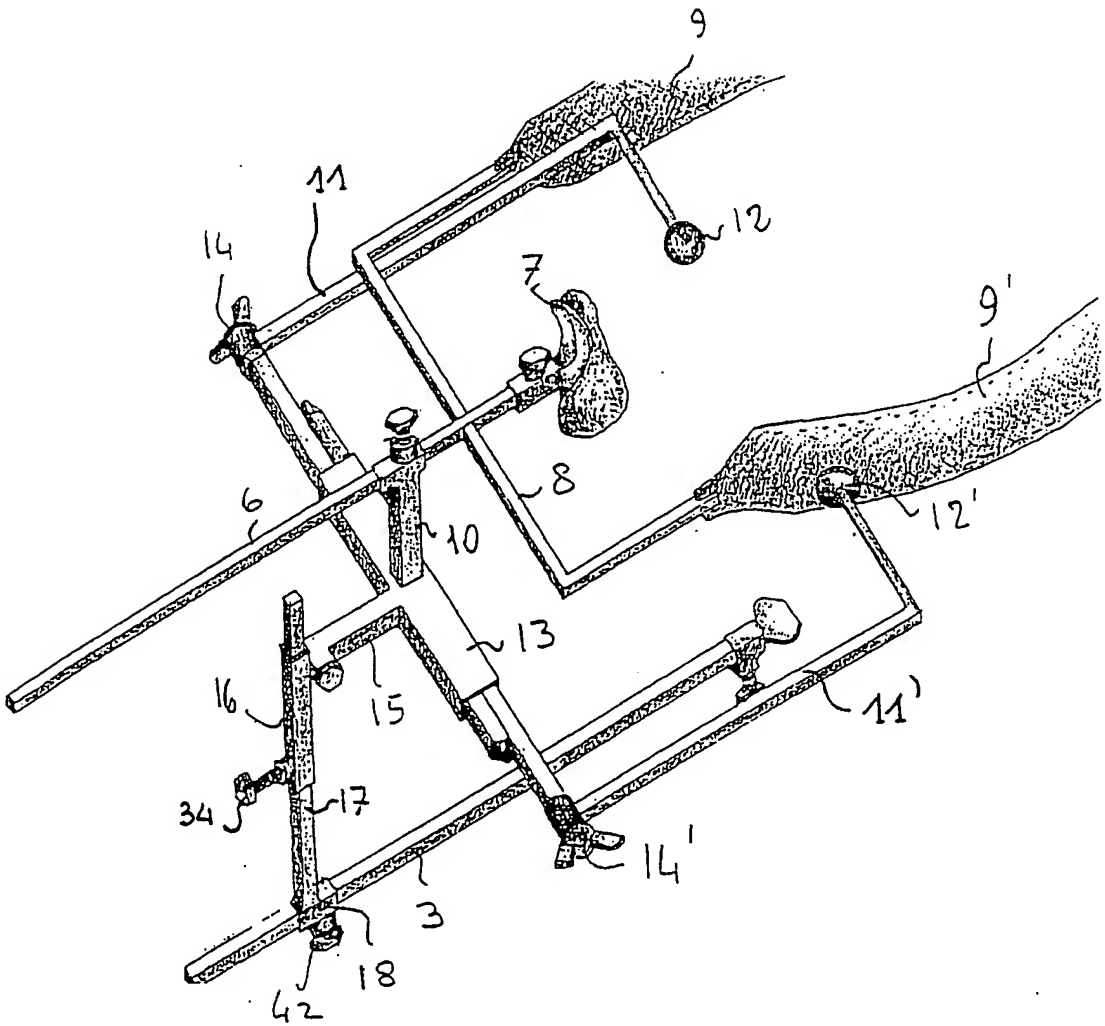


Fig. 1

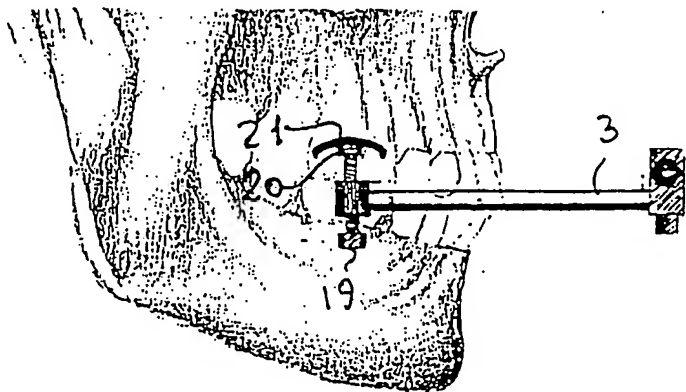


Fig. 2

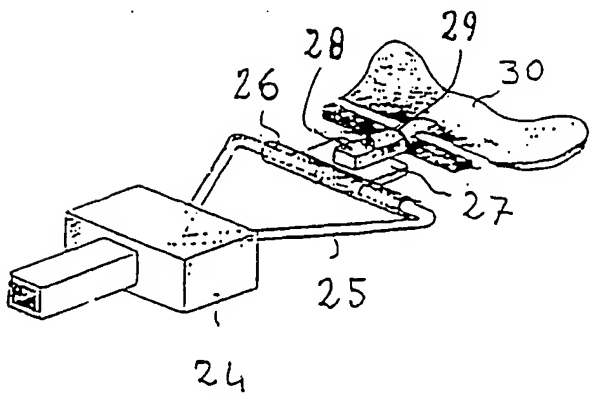


Fig. 3

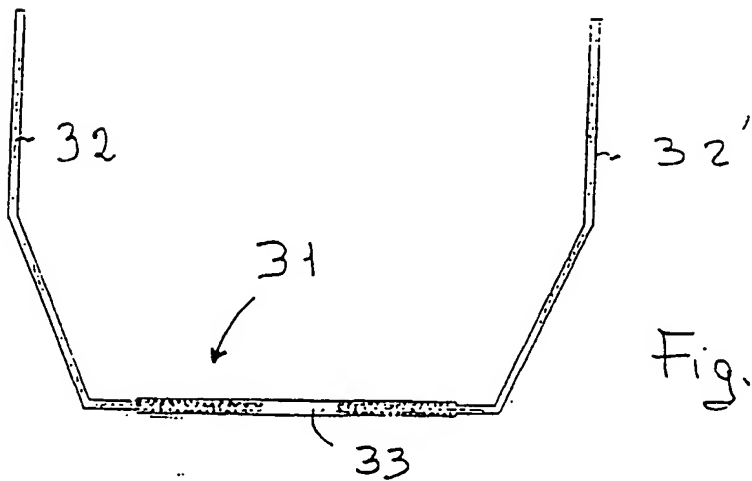


Fig. 4

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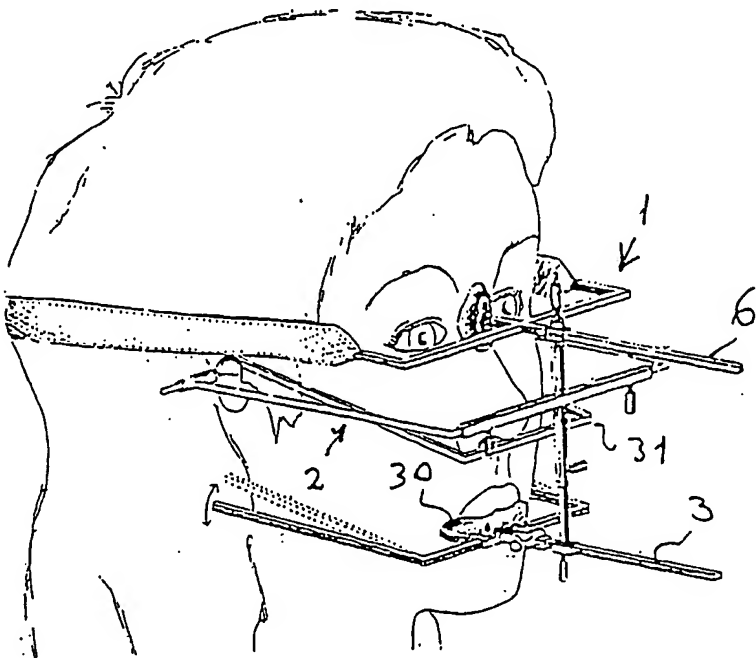


Fig. 5

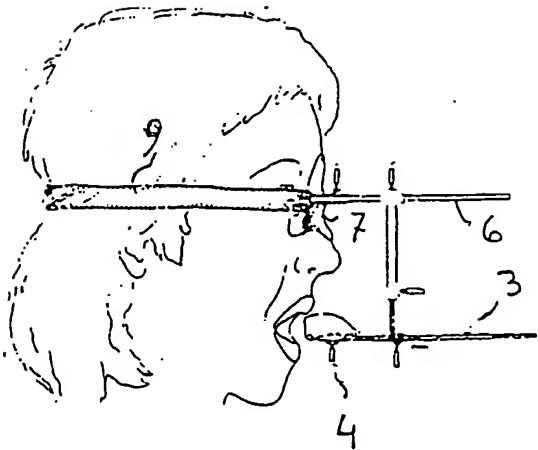


Fig. 6

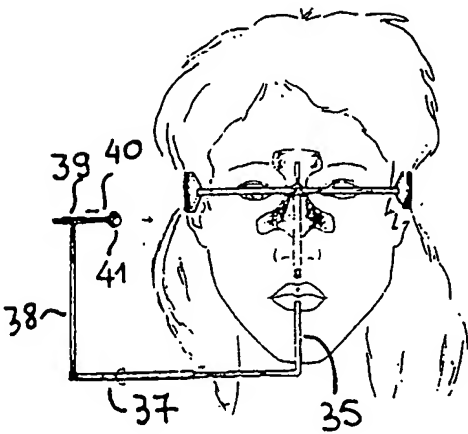


Fig. 6 bis



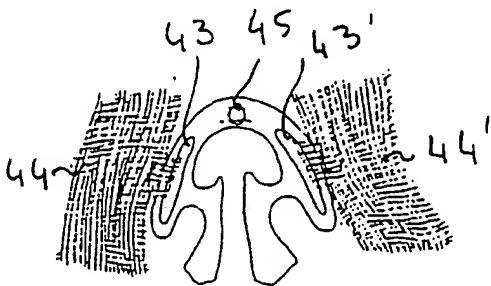


Fig. 7

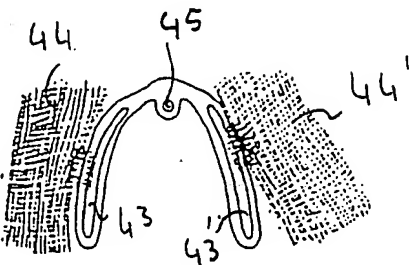


Fig. 8

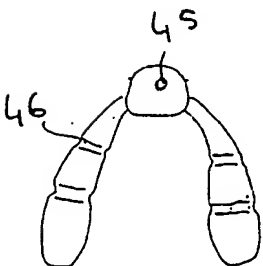


Fig. 9

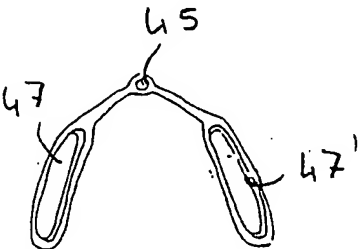


Fig. 10

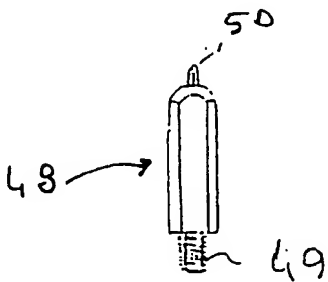


Fig. 11

## INTERNATIONAL SEARCH REPORT

International Application No

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**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC 6 A61C19/045 A61C19/05

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A61C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2 334 898 A (A. J. BIGGER ET AL) 23 November 1943 (1943-11-23) page 2, column 1, line 55-74 page 2, column 2, line 55 - page 3, column 1, line 2 figure 6	1
A	---	9-11
X	US 4 304 551 A (KAWASAKI TSUGUMICHI) 8 December 1981 (1981-12-08) column 2, line 23-62 column 6, line 59-65 figures 2A-2C, 5A-5E	1
A	---	9-11
	--- -/-	



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

Intern:      al Application No

PCT/IT 99/00144

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 42 11 017 A (KALTENBACH & VOIGT) 7 October 1993 (1993-10-07) column 2, line 67 - column 3, line 58 figures 1-4	2,4,5
A	---	3,6-8
A	US 3 574 259 A (JONES RUSSEL J) 13 April 1971 (1971-04-13) column 1, line 65 - column 2, line 16 figure 4 -----	9

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/IT 99/00144

**Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)**

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
  
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
  
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims: it is covered by claims Nos.:

**Remark on Protest**

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

**INTERNATIONAL SEARCH REPORT**

International Application No. PCT/ IT 99/00144

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-8  
Dental measurement apparatus
2. Claims: 9-10  
Mental cores for preparing impressions
3. Claim: 11  
Set of marking pins

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No  
PCT/IT 99/00144

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2334898 A	23-11-1943	NONE	
US 4304551 A	08-12-1981	JP 1245692 C	25-12-1984
		JP 55106149 A	14-08-1980
		JP 59018053 B	25-04-1984
		CH 643728 A	29-06-1984
		DE 3002174 A	14-08-1980
DE 4211017 A	07-10-1993	DE 9305082 U	05-08-1993
US 3574259 A	13-04-1971	NONE	